United States Mint, Philadelphia, Penn.,

MELTER AND REFINER'S DEPARTMENT,

9 April —, 1879.

Hon. A. Loudon Snowden,

Superintendent,

Sir,

I have carefully examined the Report of Mr A. E. Outerbridge in relation to operations at the New Orleans Mint in the Melting Department, especially to the two points of quantity melted at once, & the uniformity of the standard fineness throughout the whole melt.

I am glad he has drawn attention to the arrangements and results attained at that Mint, for I would have done so, if he had not. I regard them as the best existing, although they may also be improved, as Mr Outerbridge observed to me, in conversation, & I agree with him.

I was aware of the system of casting, in its facility of execution, neatness, & the smaller amount of manual labor it demands, & corresponded with Mr Bonzano on the subject prior to our Civil War, I had also the assent of the

RG104 E-1 Box 116

of the former Director of the Mint, the Hon. J. R. Snowden, to my introducing the system into this Mint. The Civil War immediately following, with its attendant anxieties, expelled all thoughts of change in apparatus, until the heavy silver business within a few years again forced it upon my attention, & at my request Mr. Bonzano sent on one of his melting pots to this Mint. Finding it too large for our furnaces, I could not use it, but we then ran up the amount of a Silver melt. from the usual quantity of 1500 oz. @ 1600 oz. to 3500 oz. which we daily melt, & which is the highest limit to which we can attain in our present furnaces. Mr. Outerbridge has unintentionally erred in assigning the reasons of our not melting more at a time, i.e. difficulty of stirring, & danger of segregation, neither of which affected our limit of more than 3500 oz., but simply the present size of the furnace with its bindings & parts of cast-iron rigidly limiting our capacity for melting. It is true that we ran up our gold melts to 6000 oz. & that the difficulty of stirring this amount by a man's power, equivalent to working the melted metal actively with a resistance of nearly 400 lbs., caused the

RG104 E-1 Box 116

the condemnation of so many melts, that we had to reduce our melts to 4000 @ 4500 oz. and this with Mr Bonzano's personal advice, when he witnessed the operation, while his admirable melter, Mr Tiedeman, thought that it would be better not to exceed 3500 oz. in gold. Further experience here proves that we can safely & correctly melt 4000 @ 4500 oz., our present average.

With the present plant we have therefore reached the limit of our melting capacity, being about 3500 oz. of silver & 4500 oz. Gold in each melt. If we wish to increase our capacity, we must adopt larger melting pots, & in order to employ them, we must enlarge our plant. I do not think we need essentially modify the plan of furnace, but chiefly the size. In order to employ larger crucibles, it is advisable to consider the material of which they are to be made. The simplest & cheapest is the cast-iron crucible, made of course of the most infusible cast-iron that can be procured. Mr Butterbridge believes that they employ in the French & Mexican mints wrought iron melting pots, which are

RG104 E-1 Box 116

are undoubtedly superior to cast-iron. Mr Bonzano informed me some years ago, that they were obliged to be very careful not to exceed the melting point of silver too far, lest the cast-iron pot should begin to melt, & hence if cast-iron be employed, we should have some reasonable guarantee of its hard fusibility. The great objection to the wrought-iron is the cost. I used wrought-iron crucibles for melting silver formerly, but their great cost, 75^{00} each, led me to adopt the Black lead pot. I have however revolved this subject in my mind by observing several years since the casting of Locomotive tires of a very infusible steel. Having seen such steel subjected to a pure white heat for five hours before the charge of steel in a black lead pot was melted, I am confident that a crucible made of such steel would be perfectly safe to melt any quantity of silver, without the slightest danger of melting the crucible, & this not only once, but that it could be used for the same purpose day after day, for a considerable length of time. The only question

which

RG104 E-1 Box 116

which I left undetermined in my mind was as to the mode of manufacture whether by simply casting, or by casting & annealing, or by casting & rolling into the finished crucible by a special form of roll. These questions I leave to the Steel works, but I made up my mind some six years ago, when I became interested in the question of melting steel, that when the time came to alter the Melting Plant of the Mint, I would consider the advisability of using such hardly fusible steel for crucibles, because I think that they can be easily made, of any form & size, & at much less cost than wrought iron, while they would prove equally good, & I am inclined to think rather better than wrought-iron, & certainly better than Cast-iron.

There is another point brought into prominence by Mr Peterbridge's Report, viz. the uniformity of the assays of Silver at the N. Orleans Mint, even with large melts. I was not aware of the nature of the stirrer or agitator used there until recently. I invented an iron stirrer some 12 or more years since, a cullendered iron spoon or ladle, which worked well in stirring the melts, & was not aware until within a few

RG104 E-1 Box 116

a few weeks past, that my former melting foreman, abandoned it some 10 years since. I take blame in not having more closely looked to this point. However, the cullendered plunger used now in the N. Orleans Mint is decidedly better than my ladle, & those which you allowed our blacksmiths to make are now proving their excellence in the uniformity of Ingot assays.

I propose adopting these plungers at once for Silver, and further I am disposed to try them for Gold, when convenient opportunity offers, altho all ancient prejudices are against the use of iron with melted gold.

I have expanded the subject of melting at the Mint beyond what Mr Outerbridge's paper called for, because these other subjects are necessarily connected with those in his Report, & economy & safety & accuracy in the melting operations of the Mint are necessarily interwoven with the whole.

Since the improvements contemplated involve considerable modifications of the existing plant, chiefly enlargement, which means total renovation, it is a nice question whether we dare undertake the changes at the present

RG104 E-1 Box 116

present time, when the daily demand for silver is about up to our melting capacity. On general prudential considerations it seems to me that it would be more prudent to await a change in congressional legislation, which would not demand such a heavy supply of silver coin. In the mean time we might be prepared with a solution of minor questions, the character of the crucible, wrought or cast iron, or steel, &c. We should further get measured drawings of the apparatus used in N. Orleans for casting silver ingots, with possible improved modifications suggested there or in this Mint. Again, we should more fully test Mr Outerbridge's process & arrangements for re-capturing volatilized metal during the melting processes.

When these different improvements are brought into action, & result as favorably as I anticipate, I think that our Mint will take the eminent position which it has always heretofore held.

Respectfully yours
I. A. C. Booth
M. & R.

RG104 E-1 Box 116

131½

D

U. S. Mint, Melter and Refiner's Department,

PHILADELPHIA, PENN.,

April 9th, 1879.

Jas. C. Booth

Melter and Refiner.

Subject — Mr Osterbridge's report on the melting operations of the U.S. Mint. Steel crucibles. Cullendered plungers &c

No. of Enclosures, ———

Recd April 9th 1879.

RG104 E-1 Box 116

NARA RG104, Entry 1, Box 116

[Abstract:] Subject – Mr. Outerbridge's report on the Melting Operations… 131 ½

United States Mint, Philadelphia, Penn.,
Melter and Refiner's Department,
April 9, 1879

Hon. A. Loudon Snowden,
Superintendent.

Sir,

I have carefully examined the Report of Mr. A.E. Outerbridge in relation to operations at the New Orleans Mint in the Melting Department, especially to the two points of quantity melted at once, & the uniformity of the standard fineness throughout the whole melt.

I am glad he has drawn attention to the arrangements and results attained at that Mint, for I would have done so, if he had not. I regard them as the best existing, although they may also be improved, as Mr. Outerbridge observed to me, in conversation & I agree with him.

I was aware of the system of casting in its facility of execution, neatness, & the smaller amount of manual labor it demands, & corresponded with Mr. Bonzano on the subject prior to our Civil War, I had also the assent of the former Director of the Mint, the Hon. J.R. Snowden, to my introducing the system into this Mint. The Civil War immediately following, with its attendant anxieties, expelled all thoughts of change in apparatus, until the heavy silver business within a few years again forced it upon my attention, & at my request Mr. Bonzano sent on one of his melting pots to this Mint. Finding it too large for our furnaces, I could not use it, but we then ran up the amount of Silver melts from the usual quantity of 1500 oz. @ 1600 oz. to 3500 oz. which we daily melt, & which is the highest limit to which we can attain in our present furnaces. Mr. Outerbridge has unintentionally erred in assigning the reasons of our not melting more at a time, i.e. difficulty of stirring, & danger of segregation, neither of which affected our limit of more than 3500 oz., but simply the present size of the furnace with its bindings & parts of cast-iron, rigidly limiting our capacity for melting. It is true that we ran up our gold melts to 6000 oz. & that the difficulty of stirring this amount by a man's power, equivalent to working the melted metal actively with a resistance of nearly 400 lbs., caused the condemnation of so many melts, that we had to reduce our melts to 4000 @ 4500 oz. and this with Mr. Bonzano's personal advice, when he witnessed the operation, while his admirable melter, Mr. Tiedeman, thought that it would be better not to exceed 3500 oz. in gold. Further experience here proves that we can safely & correctly melt 4000 @ 4500 oz., our present average.

With the present plant we have therefore reached the limit of our melting capacity, being about 3500 oz. of silver & 4500 oz. Gold in each melt. If we wish to increase our capacity, we must adopt larger melting pots, & in order to employ them, we must enlarge our plant. I do not think we need essentially modify the plan of furnace, but chiefly the size. In order to employ larger crucibles, it is advisable to consider the material of which they are to be made. The simplest & cheapest is the Cast-iron crucible, made of course of the most infusible cast-iron that can be procured. Mr. Outerbridge believes that they employ in the French & Mexican mints

wrought iron melting pots, which are undoubtedly superior to cast-iron. Mr. Bonzano informed me some years ago, that they were obliged to be very careful not to exceed the melting point of silver too far, lest the cast-iron pot should begin to melt, & hence if cast-iron be employed, we should have some reasonable guarantee of its hard fusibility. The great objection to the wrought-iron is the cost. I used wrought-iron crucibles for melting silver formerly, but their great cost, $75.00 each, led me to adopt the Black lead pot. I have however revolved this subject in my mind by observing several years since the casting of Locomotive tires of a very infusible steel. Having seen such steel subjected to a pure white heat for five hours before the charge of steel in a black lead pot was melted, I am confident that a crucible made of such steel would be perfectly safe to melt any quantity of silver, without the slightest danger of melting the crucible, & this not only once, but that it could be used for the same purpose day after day, for a considerable length of time. The only question which I left undetermined in my mind was as to the mode of manufacturer whether by simply casting, or by casting & annealing, or by casting & rolling into the finished crucible by a special form of roll. These questions I leave to the steel works, but I made up my mind some six years ago, when I became interested in the question of melting steel, that when the time came to alter the Melting Plant of the Mint, I would consider the advisability of using such hardly fusible steel for crucibles, because I think that they can be easily made, of any form & size, & at much less cost than wrought iron, while they would prove equally good, & I am inclined to think rather better than wrought-iron, & certainly better than Cast-iron.

There is another point brought into prominence by Mr. Outerbridge's Report, viz. the uniformity of the assays of Silver at the N. Orleans Mint, even with large melts. I was not aware of the nature of the stirrer or agitator used there until recently. I invented an iron stirrer some 12 or more years since, a cullendered iron spoon or ladle, which worked well in stirring the melts, & was not aware until within a few weeks past, that my former melting foreman, abandoned it some 10 years since. I take blame in not having more closely looked to this point. However, the cullendered plunger used now in the N. Orleans Mint is decidedly better than my ladle, & those which you allowed our blacksmiths to make are now proving their excellence in the uniformity of Ingot Assays.

I propose adopting these plungers at once for silver, and further I am disposed to try them for Gold, when convenient opportunity offers, although all ancient prejudices are against the use of iron with melted gold.

I have expanded the subject of melting at the Mint beyond what Mr. Outerbridge's paper called for, because these other subjects are necessarily connected with those in his Report, & economy & safety & accuracy in the melting operations of the Mint are necessarily interwoven with the whole.

Since the improvements contemplated involve considerable modifications of the existing plant, chiefly enlargement, which means total renovation, it is a nice question whether we dare undertake the changes at the present time, when the daily demand for silver is about up to our melting capacity. On general prudential considerations it seems to me that it would be more prudent to await a change in congressional legislation, which would not demand such a heavy supply of silver coin. In the mean time we might be prepared with a solution of minor questions, the character of the crucible, wrought or cast iron, or steel, &c. We should further get measured

drawings of the apparatus used in N. Orleans for casting silver ingots, with possible improved modifications suggested there or in this Mint. Again, we would more fully test Mr. Outerbridge's process & arrangements for recapturing volatilized metal during the melting processes.

When these different improvements are brought into action, & result as favorably as I anticipate, I think that our Mint will take the eminent position which it has always heretofore held.

Respectfully yours,
Jas. C. Booth
M & R